INFORMATION SHEET ON DRYING-RATE NOMOGRAPHS
IV. SHREDDED CABBAGE

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A method of estimating drying times from drying-rate nomographs has been published in the form of an information sheet (AIC-31-I), and drying-rate nomographs are available for riced white potatoes (AIC-31-I), blanched sweet corn (AIC-31-II), and white potato strips under vertical air flow conditions (AIC-31-III).

The drying characteristics of 1/8" cabbage shreds are presented nomographically in this information sheet. The cabbage, Flat Dutch variety, was prepared in a normal manner, i.e., hand trimmed, quartered, cored, washed, and shredded in a commercial kraut cutter. Blanching was accomplished by a 3-minute treatment in a continuous atmospheric steam blancher.

The first set of nomographs (Figures 1 to 4) deals with the drying rates of cabbage after shredding, loading on metal grid trays, blanching, and drying without further disturbance. The second set (Figures 5 to 8) is for cabbage after blanching on frames, reloading on dry wooden slat trays, and drying. Slow-drying clumps are an undesirable result of reloading the blanched cabbage. Consequently, the two sets of drying-rate nomographs approximate the maximum and minimum drying rates which should be encountered in good plant practice. If the shredded cabbage is to be blanched on wooden slat trays and dried without reloading, difficulties due to uneven spreading may be minimized, but the drying will be slowed because of the extra water absorbed by the trays.

The specific figures included in this information sheet are:

Metal Grid Trays	Wooden Slat Trays	Subject
Figure 1	Figure 5	Drying from T_o = 14.2 to T = 0.10.
Figure 2	Figure 6	Values of $f(L_o)$ and f(V) for equation (1).
Figure 3	Figure 7	Drying from T = 0.10 to T_f.
Figure 4	Figure 8	θ corrections for $T_o > 14.2$.

The effects of tray loading density and air velocity upon drying times determined from Figure 1 or 5 are calculated according to the equation

$$\theta \text{ (at } L_o, V) = \theta_r \cdot f(L_o) \cdot f(V) \qquad (1)$$

In this equation, θ_r is the drying time from T_o to T under reference conditions (of L_o = 1.0 lb./sq.ft. and V = 800 f./min., as obtained from Figure 1 or 5), and $f(L_o)$ and f(V) are selected from Figure 2 and Figure 6, respectively, corresponding to the values of L_o and V under consideration, at the value of T to which θ and θ_r apply. The nomenclature used is that listed in Information Sheet AIC-31-I.

The drying times indicated by the nomographs are unattainable unless care is taken in the preparation, blanching, and loading of the shredded cabbage. Excessive handling or over-blanching aids clump formation, particularly if a fixed quantity of blanched shreds is dumped on a tray and spread with no attempt to maintain an open structure. Under extreme conditions, mishandling may increase the indicated drying times by as much as 50 percent.

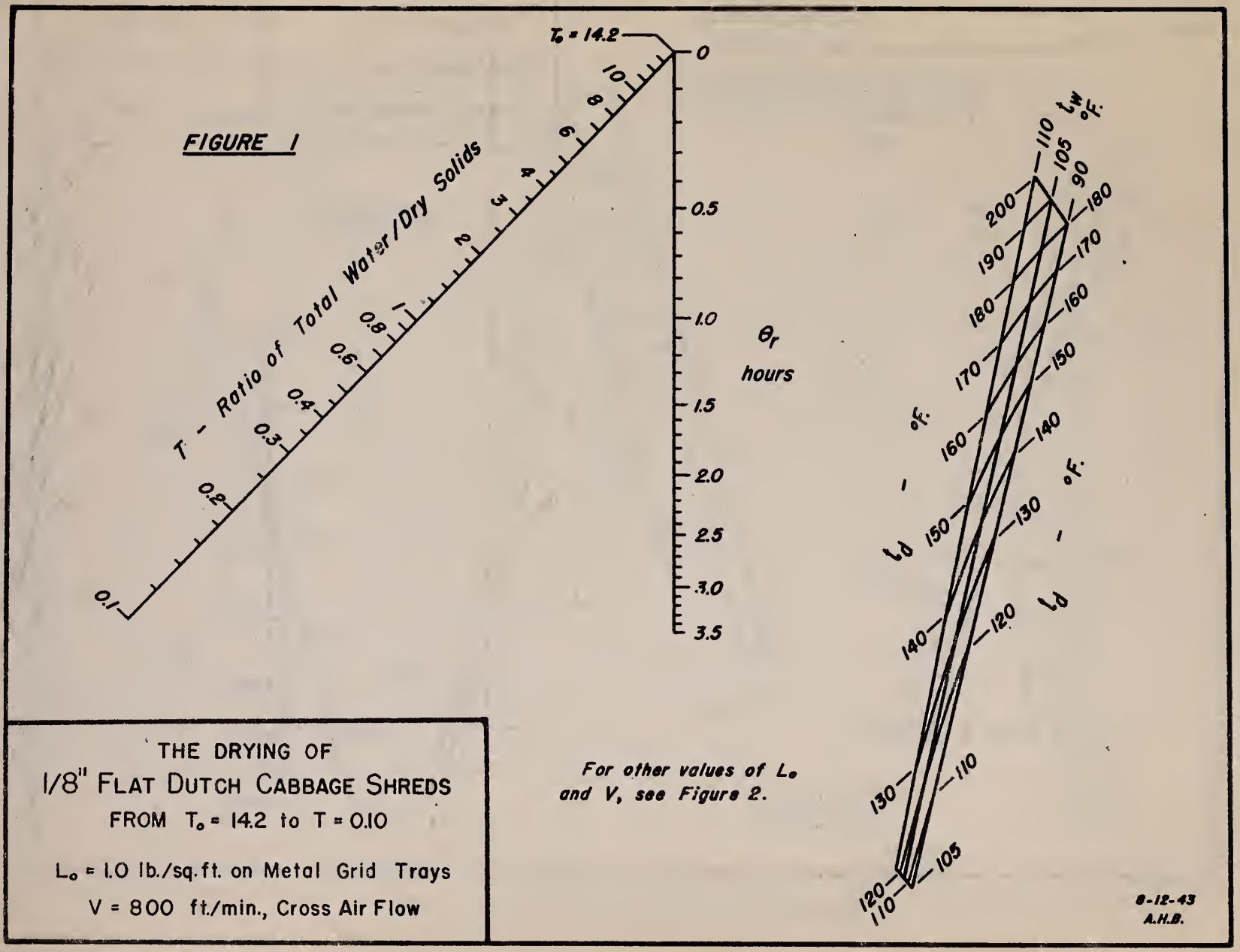


FIGURE 1
T - Ratio of Total Water/Dry Solids
T_o = 14.2
0.1
0.2
0.3
0.4
0.6
0.8
1
2
3
4
6
8
10
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
θ_r
hours
t_w °F.
110
105
90
200
190
180
170
160
150
140
130
120
110
105
120
110
°F.
t_d
°F.
t_d
°F.
t_d
For other values of L_o and V, see Figure 2.
THE DRYING OF
1/8" FLAT DUTCH CABBAGE SHREDS
FROM T_o = 14.2 to T = 0.10
L_o = 1.0 lb./sq.ft. on Metal Grid Trays
V = 800 ft./min., Cross Air Flow
8-12-43
A.H.B.

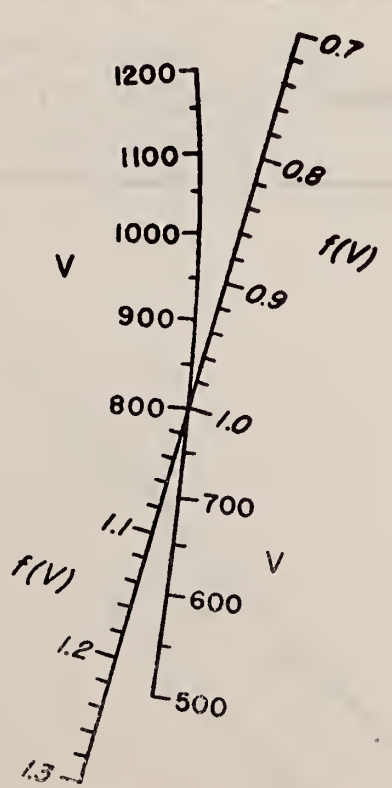
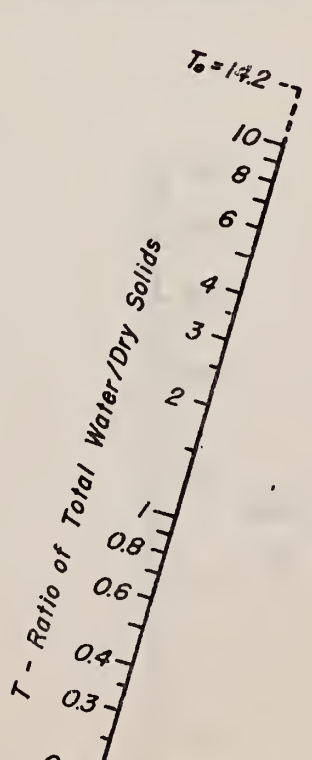
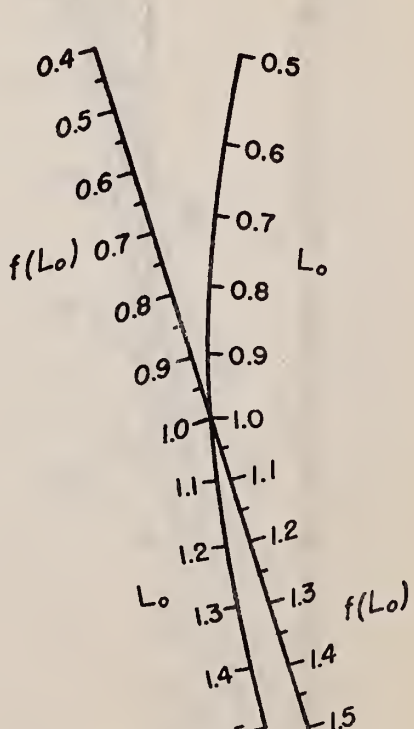


FIGURE 2





Drying of 1/8" Flat Dutch Cabbage Shreds

VALUES OF $f(L_o)$ AND $f(V)$ FOR EQUATION (I)

Metal Grid Trays Cross Air Flow

KEY

Connect T to value of L_o or V, read corresponding value of $f(L_o)$ or $f(V)$.

L_o and V are considered independent of each other.

8-10-43
A.H.B.

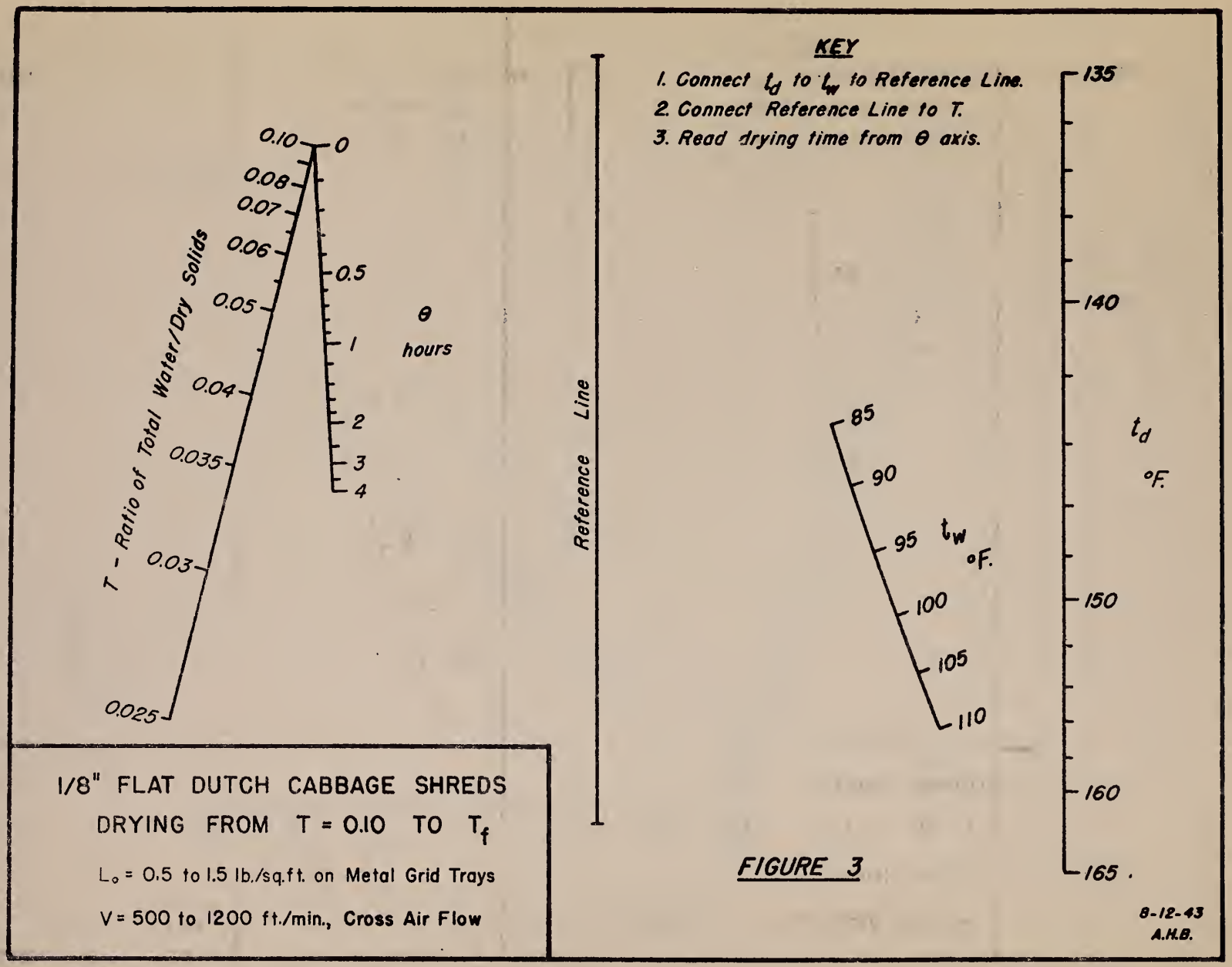

KEY
1. Connect t_d to t_w to Reference Line.
2. Connect Reference Line to T.
3. Read drying time from θ axis.
T - Ratio of Total Water/Dry Solids
0.10
0.08
0.07
0.06
0.05
0.04
0.035
0.03
0.025
θ
hours
0
0.5
1
2
3
4
Reference Line
t_w °F.
85
90
95
100
105
110
t_d °F.
135
140
150
160
165
1/8" FLAT DUTCH CABBAGE SHREDS
DRYING FROM T = 0.10 TO T_f
L_o = 0.5 to 1.5 lb./sq.ft. on Metal Grid Trays
V = 500 to 1200 ft./min., Cross Air Flow
8-12-43
A.H.B.

FIGURE 3

Drying of 1/8" Flat Dutch Cabbage Shreds

CORRECTION OF θ_r FOR $T_o > 14.2$

L_o = 1.0 lb./sq.ft. on Metal Grid Trays

V = 800 ft./min., Cross Air Flow

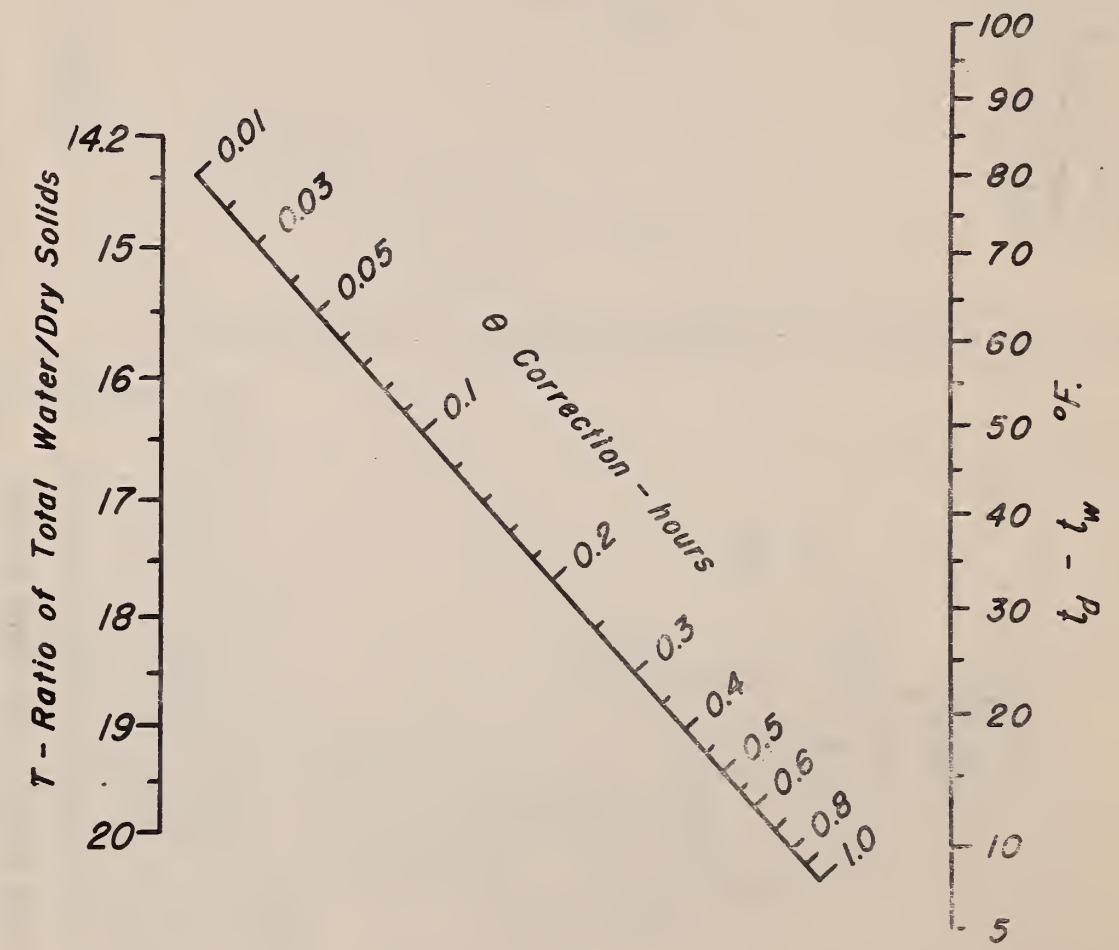
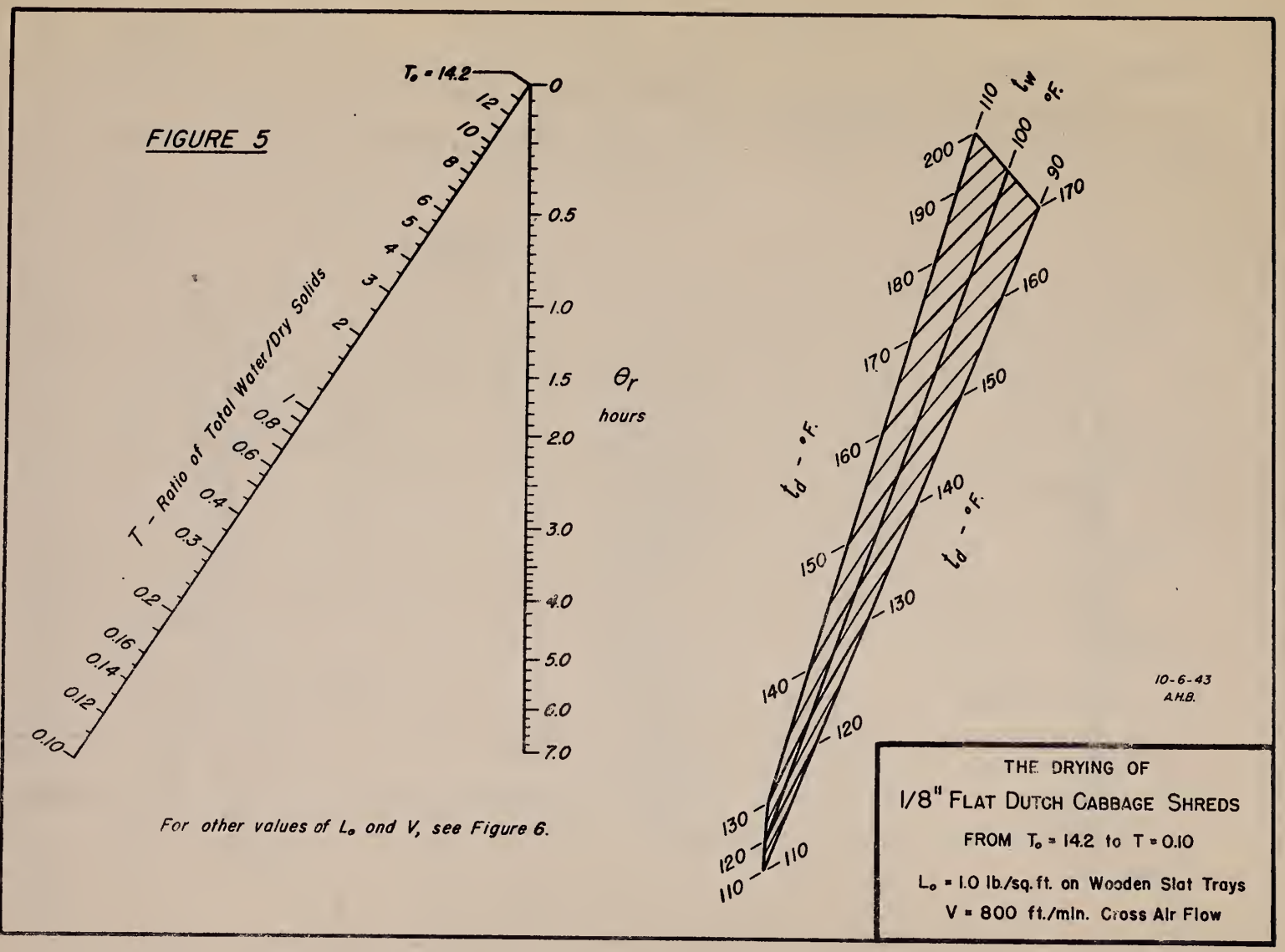


FIGURE 4

8-11-43

H.B.



For other values of L_o and V, see Figure 6.

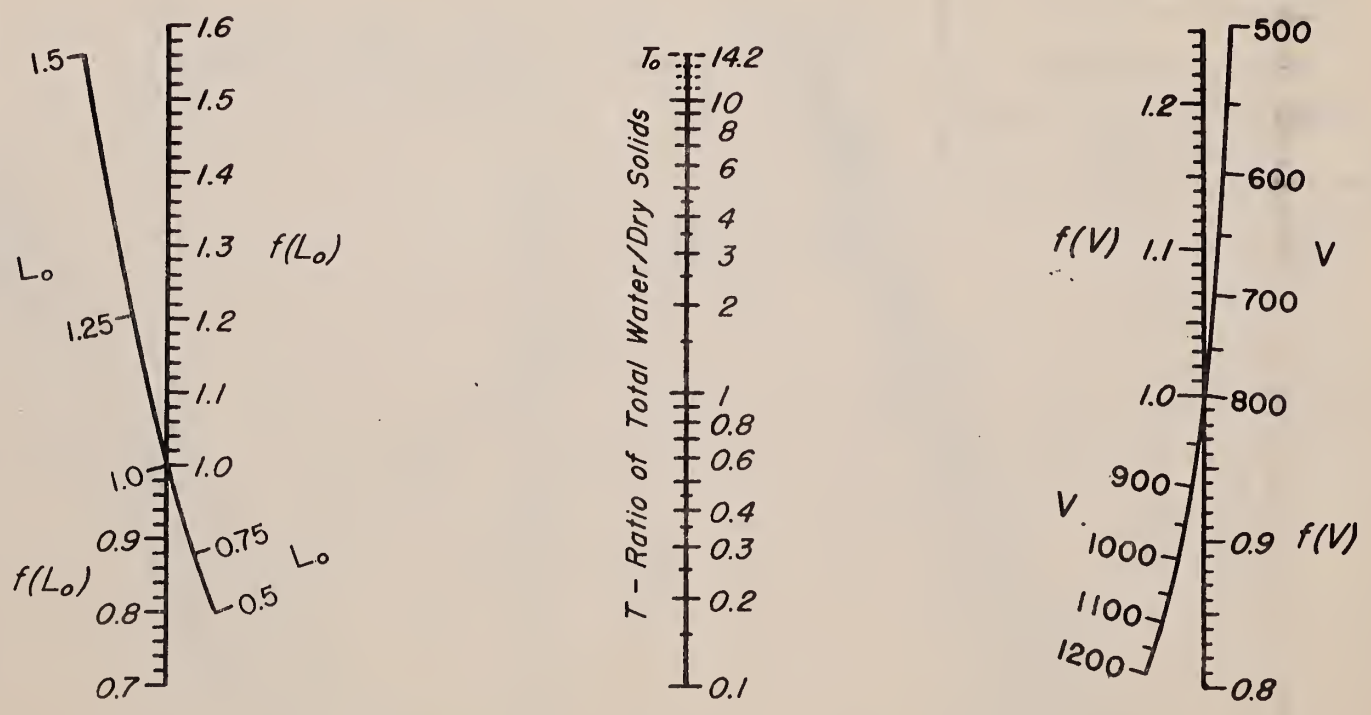


FIGURE 6

10-5-43
A.H.B

Drying of 1/8" Flat Dutch Cabbage Shreds

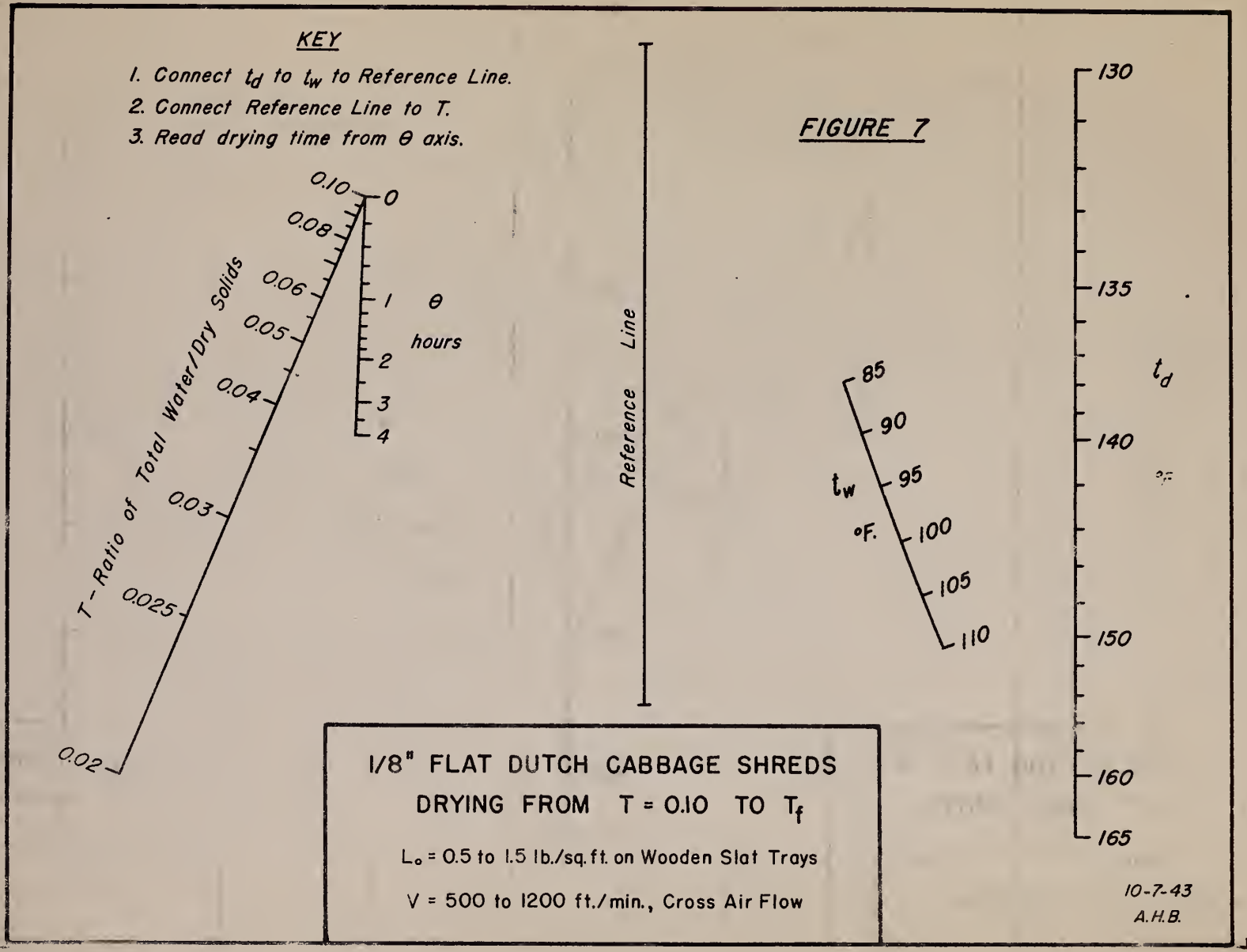
VALUES OF $f(L_o)$ AND $f(V)$ FOR EQUATION (I)

Wooden Slat Trays Cross Air Flow

KEY

Connect T to value of L_o or V, read corresponding value of $f(L_o)$ or $f(V)$.

L_o and V are considered independent of each other.


KEY
1. Connect t_d to t_w to Reference Line.
2. Connect Reference Line to T.
3. Read drying time from θ axis.
FIGURE 7
T - Ratio of Total Water/Dry Solids
0.10
0.08
0.06
0.05
0.04
0.03
0.025
0.02
θ
hours
0
1
2
3
4
Reference Line
t_w
°F.
85
90
95
100
105
110
t_d
°F.
130
135
140
150
160
165
1/8" FLAT DUTCH CABBAGE SHREDS
DRYING FROM T = 0.10 TO T_f
L_o = 0.5 to 1.5 lb./sq. ft. on Wooden Slat Trays
V = 500 to 1200 ft./min., Cross Air Flow
10-7-43
A.H.B.

KEY

1. Connect t_w to $t_d - t_w$ to Reference Line.
2. Connect Reference Line to T_o.
3. Read θ correction.

Drying of 1/8" Flat Dutch Cabbage Shreds

CORRECTION OF θ_r FOR $T_o > 14.2$

L_o = 1.0 lb./sq. ft. on Wooden Slat Trays

V = 800 ft./min., Cross Air Flow

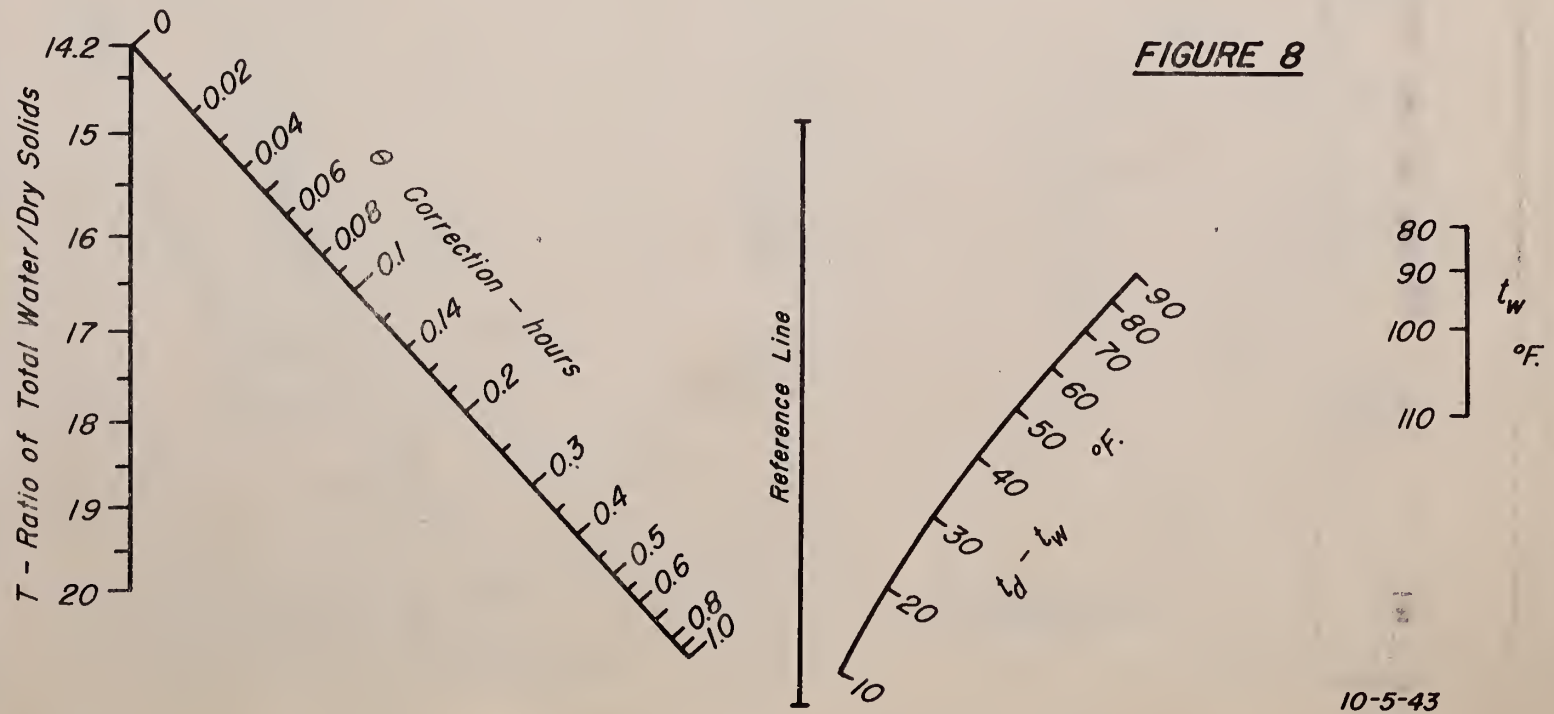


FIGURE 8

10-5-43
A.H.B.